VI. "On the Physiology of the Carbohydrates in the Animal System." By F. W. PAVY, M.D., F.R.S. Received December 13, 1883.

[Publication deferred.]

The Society adjourned over the Christmas Recess to Thursday, January 10th, 1884.

January 10, 1884.

THE PRESIDENT in the Chair.

The Presents received were laid on the table, and thanks ordered for them.

The following Papers were read:—

I. "On the Transfer of Energy in the Electromagnetic Field." By J. H. POYNTING, M.A., late Fellow of Trinity College, Cambridge, Professor of Physics, Mason College, Birmingham. Communicated by Lord RAYLEIGH, M.A., D.C.L., F.R.S. Received December 17, 1883.

(Abstract.)

A space containing electric currents may be regarded as a field where energy is transformed at certain points into the electric and magnetic kinds by means of batteries, dynamos, thermoelectric actions, and so on, while in other parts of the field this energy is again transformed into heat, work done by electromagnetic forces, or any form of energy yielded by currents. Formerly a current was regarded as something travelling along a conductor, attention being chiefly directed to the conductor, and the energy which appeared at any part of the circuit, if considered at all, was supposed to be conveyed thither through the conductor by the current. But the existence of induced currents and of electromagnetic actions at a distance from a primary circuit from which they draw their energy, have led us, under the guidance of Faraday and Maxwell, to look upon the medium surrounding the conductor as playing a very important part in the development of the phenomena. If we believe in the continuity of the motion of energy, that is, if we believe that when it disappears at one point and reappears at another, it must have passed through the intervening space, we are forced to conclude that the surrounding medium contains at least a part of the energy, and that it is capable of transferring it from point to point.

Upon this basis Maxwell has investigated what energy is contained

in the medium, and he has given expressions which assign to each part of the field a quantity of energy depending on the electromotive and magnetic intensities, and on the nature of the matter at that part in regard to its specific inductive capacity and magnetic permeability. These expressions account, as far as we know, for the whole energy. According to Maxwell's theory currents consist essentially in a certain distribution of energy in and around a conductor, accompanied by transformation and consequent movement of energy through the field.

Starting with Maxwell's theory we are naturally led to consider the problem, how does the energy about an electric current pass from point to point; that is, by what paths and according to what law does it travel from the part of the circuit where it is first recognisable as electric and magnetic to the parts where it is changed into heat or other forms.

The aim of this paper is to prove that there is a general law for the transfer of energy according to which it moves at any point perpendicularly to the plane containing the lines of electric and magnetic force, and that the amount crossing unit of area per second of this plane is equal to the product of the two intensities multiplied by the sine of the angle between them divided by 4π, while the direction of flow of energy is that in which a right-handed screw would move if turned round from the positive direction of the electromotive to the positive direction of the magnetic intensity. After the investigation of the general law several applications are given to show how the energy moves in the neighbourhood of various current-bearing circuits.

II. "Some Experiments on Metallic Reflection. IV. On the Amount of Light Reflected by Metallic Surfaces. II." By Sir JOHN CONROY, Bart., M.A. Communicated by Professor STOKES, Sec. R.S. Received December 15, 1883.

In a paper which Professor Stokes did me the honour of communicating to the Royal Society, and which appeared in the "Proceedings," vol. 35, p. 26, I gave an account of some experiments I had made on the amount of light reflected by polished metallic surfaces when ordinary unpolarised light was incident upon them.

The light of a paraffine lamp fell either directly, or after reflection from the metallic surface, on a photometer, and the readings were made by altering the distance at which another similar lamp had to be placed from the photometer in order to produce an equal illumination.

I have repeated the experiments with the steel and speculum metal